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SUPERCONDUCTING SUPER COLLIDER PROJECT

HEARING

BEFORE THE

SUBCOMMITTEE ON INTERNATIONAL SCIENTIFIC COOPERATION

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

MARCH 8, 1989

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SUPERCONDUCTING SUPER COLLIDER PROJECT

WEDNESDAY, MARCH 8, 1989

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON INTERNATIONAL SCIENTIFIC COOPERATION,
Washington, D. C.

The subcommittee met at 10:30 a.m. in Room 2318 of the Rayburn House Office Building, the Honorable Ralph M. Hall, chairman of the subcommittee, presiding.

Present: Representatives Hall, Sensenbrenner, Packard and Barton.

Mr. HALL. The Committee will come to order.

I think we have some overlapping Committee meetings this morning and some of the other members will be joining us at a later time.

Today's hearing is the third in what has become a series of hearings by this Subcommittee to assess the interest and the potential for significant foreign participation and contributions to the Superconducting Super Collider project, and it probably won't be the last given the size and expense of the project. In fact, if time permits, this Subcommittee will likely have further hearings on this same subject in which public witnesses representing foreign and domestic industry and foreign governments will be invited to testify.

This is a combination legislative and oversight hearing and the Subcommittee has before us today H.R. 1195, which is co-sponsored by the ranking minority member of the Subcommittee, Mr. Packard, and Mr. Barton—Mr. Packard of California and Mr. Barton of Texas.

Last year, the full Committee reported H.R. 4505, a DOE R&D authorization bill that passed the House before running out of steam over in the other body. Included in that bill were provisions on limitations on foreign contributions, eligible contract recipients, restrictions on foreign manufacture and the terms and conditions under which state contributions will be received from the selected state.

Many of these provisions were not subject to hearings and the Committee became aware of some of the difficulties they posed only after the bill was ordered reported by the Committee. And the bill before us today has the same general thrust and scope of those provisions in last year's bill but we've changed it some to take into consideration some of the criticisms that were raised last year by the Department of Energy and by others.

The oversight part of the hearing will deal with discussing the Department's activities in its continuing effort to ascertain the

level and type of interest and participation and contribution to the SSC.

We have with us today some very distinguished men. We have with us as the Department's witness Dr. James F. Decker, who is Deputy Director of the Office of Energy Research. He is accompanied by George S. Bradley, Jr., Principal Deputy Assistant Secretary for International Affairs. We've had George with us before and he's been very helpful. And we're glad to see our friend, Dr. Bill Hess, the Associate Director of the Office of High-Energy and Nuclear Physics. Both Dr. Decker and Mr. Bradley are not strangers to this Committee and we're especially pleased to have Dr. Hess join with us today.

We also have my friend and a man for whom I have high regard, Tom Luce, who is Chairman of the Texas National Research Laboratory Commission. He is a good right arm for Governor Clements and his duties are to administer the $1 billion authorized by the voters of Texas and to deliver the site to the DOE. He does a good job and we hope he'll express my personal appreciation to Governor Clements for the major part he played in making Texas one of the states that made itself available to the Department of Energy for selection and certainly helped to put our best foot forward.

With that, I recognize one of the leading members of this Committee, Mr. Sensenbrenner, who will have opening remarks.

And, because we have other meetings, the ranking member, Congressman Packard, has opening remarks and I'm sure he'll be here in time to deliver them.

Mr. SENSENBRENNER. Thank you very much, Mr. Chairman.

Let the record state that I have recently retired as the ranking minority member on this Subcommittee to go off to bigger and better things out in space, but I still maintain and interest and a seat as a member of this Subcommittee and a keen interest in the building and financing of the SSC.

At the outset, let me state that I was one of the few people in Wisconsin that did not join the bandwagon to site the SSC outside of Chicago, and I am very happy with the siting of the SSC in Texas, I do not think that the Congress should re-open this matter and I think that we ought to proceed with the SSC's construction in the State of Texas, as was decided by the Reagan Administration.

On the other hand, let me say that I think we have some big problems in the financing of big science projects. Both the SSC and the space station are two big science projects which will require large expenditures in the out years of the budget and there is a real question of whether the country will support funding two large science projects at the same time when we're in the process of reducing the Federal budget deficit as mandated by the Gramm-Rudman Act.

I believe very strongly that one of the ways to ensure the construction of the SSC is to maximize foreign contributions to its construction, because every dollar that we are able to raise from foreign sources is one less dollar that we will have to justify to the Budget Committee, to our colleagues in the House of Representatives, as well as to the American taxpayers who foot the bill.

And if we don't get a large foreign contribution along the lines of the 25 to 33 percent that was stated in the authorization bill which we passed in the House of Representatives in the 100th Congress, I think the SSC is that much more in jeopardy.

So I welcome our witnesses today and I hope that you will have some good news and some cash for us to report about.

Thank you.

Mr. HALL. Thank you, Congressman.

I didn't want to relate to them that you had been the ranking minority because I hated for them to think that anybody would ever leave this Committee to go anywhere else.

[Laughter.]

But we are very pleased to have your usual sensible thrust and input and suggestions and, of course, we've got a lot of work to do together to work exactly toward that that you've set out, and that's to get all the foreign participation legitimately and sensibly that we can get to keep this operation going, including foreign participation from the State of Texas itself.

So with that, Dr. Decker, we will be glad to recognize you and you may put your statement into the record and talk off the cuff or you can speak—you can do almost anything you want to do.

So I recognize you at this time.

STATEMENT OF DR. JAMES F. DECKER, DEPUTY DIRECTOR FOR ENERGY RESEARCH, U.S. DEPARTMENT OF ENERGY, ACCOMPANIED BY GEORGE J. BRADLEY, JR., PRINCIPAL DEPUTY ASSISTANT SECRETARY, INTERNATIONAL AFFAIRS AND ENERGY EMERGENCIES, U.S. DEPARTMENT OF ENERGY, AND, DR. WILMOT HESS, ASSOCIATE DIRECTOR, OFFICE OF HIGH ENERGY AND NUCLEAR PHYSICS, U.S. DEPARTMENT OF ENERGY

Dr. DECKER. Thank you, Mr. Chairman, and members of the Committee. I am pleased to appear before you to discuss the status of the Department of Energy's efforts to obtain non- Federal contributions to the Superconducting Super Collider project and to comment on the proposed legislation on this topic.

As you indicated, Mr. Bradley and I have appeared before this Subcommittee on two previous occasions to discuss the international side of the Super Collider project.

I'd like to take a few minutes to bring you up to date on progress on several aspects of the project that has occurred since our last appearance before you.

In January of this year, the Department completed a final step in its extensive site selection process, naming a location in the State of Texas as a site for the SSC. As you know, we were forbidden by legislation from considering state contributions to the project in our evaluation of the proposed sites. After the Texas site was selected, a sealed envelope submitted with the Texas proposal was opened and it contained an offer of state contributions totalling about a billion dollars. We will soon start detailed discussions with the State of Texas to better understand how their contribution can be used to offset Federal expenditures on this project.

The Department has also conducted a competitive selection process for a management and operating contractor to construct and operate the SSC. Universities Research Association, with two subcontractors, EG&E, Incorporated, and Sverdrup Corporation were chosen and a contract has been negotiated.

More recently, President Bush has shown his support for the SSC project, and the request for $250 million in the Fiscal Year 1990 budget was one of President Bush's initiatives in his statement of priorities.

Now I want to turn to international activities. Last year we described to you the visits of formal delegations that Mr. Bradley and I had led last January to the six major industrialized countries who share membership with the United States in the Economic Summit.

Our purpose was to follow up on a formal letter from Secretary Herrington inviting each of the countries to participate in the SSC. Those visits served to initiate discussions. A second round of visits was made in the May- June time frame to keep communications channels open.

During these visits we found varying degrees of interest of the countries in possible contributions to the SSC. It is expected that most countries with high-energy physics programs will want to participate in the science phase of the project and to contribute to the large expensive detectors, as is commonly done in today's operating accelerators.

We also expect that several countries will make substantial contributions to construction of the SSC. Several countries have initiated formal processes internally, generally starting with their high-energy physics communities to arrive at a decision on their level of participation. Not surprisingly, we discovered some reluctance on the part of other countries to move towards serious negotiations during the last year.

There are two reasons for this. First, there was a presidential election here in the United States and a question of whether the new administration would, in fact, support the SSC project. And the second difficulty was that the Congress had not appropriated construction funds for the project in the Fiscal Year 1989 budget.

Despite these obstacles, some progress has been made. First, former Secretary Herrington and the Deputy Minister of Italy's Ministry of Industry and Handicraft issued a communique in late March calling for exploration of ways in which Italy might support the SSC design, construction and manufacture of components.

Second, there have been encouraging informal discussions with several additional countries, including Switzerland, Finland and Spain.

Third, in response to an invitation from South Korea, I led a delegation there and met with government, industry and university officials. As a result of that visit, we have received a strong letter of support indicating South Korea's desire to participate in the construction of the SSC.

Fourth, India entered into a provisional agreement to participate in the SSC construction through up to $50 million of in-kind contributions, providing the U.S. Government commits funds to construc-

tion. This provisional agreement is a new activity under the new extension of the Science and Technology Agreement with India.

Now I want to turn to the proposed legislation: the Superconducting Super Collider Non-Federal Contribution Act of 1989.

The SSC is a complex project in many ways, particularly the financing. The Department's Fiscal Year 1990 budget request assumes $1.8 billion of non-federal contributions. As I stated earlier, the State of Texas is providing a very substantial contribution that will constitute a significant fraction of that total. The remainder of non-Federal contributions will likely have to come from foreign contributions which we expect from a number of countries. We do not expect cash from foreign countries but, rather, in-kind contributions, such as providing components.

At the same time, we have a commitment to help build American industrial capability in the technologies of the SSC. U.S. industries are certainly interested. At a recent conference on the SSC in New Orleans, about 160 U.S. companies were represented.

Putting the pieces together: Federal, State, and foreign contributions, with our commitment to U.S. industry will be very challenging. My plea to you is for flexibility. If too many constraints are placed on the Secretary in putting these pieces together, it could become an impossible task. Therefore, we would prefer not to have specific figures legislated for either percentage of foreign participation or the exact percentage of individual components or subsystems to be manufactured in the United States.

Now I'd like to briefly address the provision in the legislation concerning the State contribution. The Department is particularly concerned with the section that would provide to the host state a refund of cash payments or in-kind contributions if the project is not completed. That section sends a message to potential foreign partners that the host state must feel the U.S. Government is not a reliable partner. It is very likely that all of the foreign contributors to the SSC would want similar guarantees. I think it also sets a bad precedent for state participation in other Federal projects.

There are generally risks as well as benefits associated with any project. Should the parties that benefit from such joint projects not share some of the risks?

If the U.S. starts construction of the SSC, there must be a commitment to follow through. I think otherwise the whole concept of jointly building with other countries large expensive research facilities to avoid duplication of effort in the world will quickly die.

In summary, we support the intent of the legislation. We are seeking approximately one-third non-Federal contributions and, at the same time, we wish to ensure significant involvement of American industries. We ask for the broadest guidelines in legislation on non-Federal participation in the SSC. We will continue to work closely with the Subcommittee and its staff to develop legislation that satisfies our mutual goals.

Mr. Bradley, Dr. Hess and I would be pleased to answer any questions that you may have.

[The prepared statement of Dr. Decker follows.]

Statement of

James F. Decker

Deputy Director for Energy Research

Accompanied by

George J. Bradley, Jr.

Principal Deputy Assistant Secretary

International Affairs and Energy Emergencies

and

Dr. Wilmot Hess

Associate Director

Office of High Energy and Nuclear Physics

U.S. Department of Energy

before the

House Committee on Science, Space, and Technology

Subcommittee on International Scientific Cooperation

March 8, 1989

I AM PLEASED TO BE ABLE TO APPEAR BEFORE THIS SUBCOMMITTEE TO BRIEF YOU ON WHAT HAS HAPPENED IN THE INTERNATIONAL ARENA OF THE SUPERCONDUCTING SUPER COLLIDER PROJECT THIS LAST YEAR AND TO TELL THE SUBCOMMITTEE OF THE DEPARTMENTS' PLANS ON PROCEEDING WITH THIS PROJECT. I WILL THEN COMMENT BRIEFLY ON PROPOSED LEGISLATION ON SSC NON-FEDERAL PARTICIPATION. I AM ACCOMPANIED BY MR. GEORGE J. BRADLEY, JR., PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR INTERNATIONAL AFFAIRS AND ENERGY EMERGENCIES; AND BY DR. WILMOT N. HESS, ASSOCIATE DIRECTOR FOR HIGH ENERGY AND NUCLEAR PHYSICS OF THE OFFICE OF ENERGY RESEARCH.

AS THE MEMBERS OF THIS SUBCOMMITTEE MAY REMEMBER, MR. BRADLEY AND I HAVE APPEARED BEFORE THIS COMMITTEE ON TWO PREVIOUS OCCASIONS TO DISCUSS THE INTERNATIONAL SIDE OF THE SSC PROJECT. THE FIRST WAS IN MAY 1987, SHORTLY AFTER THE ANNOUNCEMENT THAT PRESIDENT REAGAN HAD DECIDED TO SUPPORT CONSTRUCTION OF THE SSC. THE SSC WILL PROVIDE AN EXTRAORDINARY NEW RESEARCH TOOL FOR FUNDAMENTAL SCIENCE THAT COULD PROFOUNDLY STIMULATE AMERICAN SCIENCE EDUCATION AND ATTRACT THE BEST SCIENTISTS WORLDWIDE, AS WELL AS ADVANCE MAN'S KNOWLEDGE OF MATTER AND ENERGY.

A YEAR AGO, WE DESCRIBED THE VISITS OF FORMAL DELEGATIONS WHICH MR. BRADLEY AND I HAD LED TO THE SIX MAJOR INDUSTRIALIZED COUNTRIES THAT SHARE MEMBERSHIP WITH THE UNITED STATES IN THE ECONOMIC SUMMIT. OUR PURPOSES WERE TO OPEN DISCUSSIONS AND TO DETERMINE THE DEGREE OF INTEREST EACH COUNTRY MIGHT HAVE IN PARTICIPATING IN THE SSC PROJECT. WE CHOOSE TO FOCUS OUR EFFORTS ON THE COUNTRIES OF WESTERN EUROPE, AND ON JAPAN AND CANADA, BECAUSE WE HAVE LONG HAD

VERY SUCCESSFUL SCIENTIFIC COOPERATION WITH THEM AND OVER FIVE YEARS OF HIGH LEVEL INTERGOVERNMENTAL DISCUSSIONS ON WAYS TO AVOID DUPLICATION OF MAJOR RESEARCH FACILITIES AND COSTLY EQUIPMENT THROUGH ENHANCED COOPERATION IN HIGH ENERGY PHYSICS.

AS WE REPORTED A YEAR AGO, THESE OPENING DISCUSSIONS CONFIRMED WHAT HAD BEEN APPARENT FROM THE EARLIER MEETINGS: THAT THE GOVERNMENTS AND INDUSTRIES OF THESE COUNTRIES AND THEIR SCIENCE COMMUNITIES HAVE HIGH INTEREST IN THE PROJECT, BUT THAT BEFORE WE COULD EXPECT A COMMITMENT FROM THEM TO PARTICIPATE IN THE SSC, A COMMITMENT FROM THE ENTIRE U. S. GOVERNMENT TO THE PROJECT WAS ESSENTIAL. THESE COUNTRIES FOLLOW OUR BUDGET DELIBERATIONS AND KNOW OF THE DEDICATION WE HAVE TO REDUCING THE DEFICIT. THEY ALSO HAVE THEIR OWN FINANCIAL CONCERNS FOR FUNDING THEIR SCIENCE PROGRAMS AND PROJECTS. WE BELIEVE THAT THE RESOLUTION OF THEIR FUNDING PROBLEMS FOR ADVANCED HIGH ENERGY PHYSICS RESEARCH MAY WELL ENCOURAGE THEIR COOPERATION IN THE SSC. TO THIS END WE CONTINUE TO MAINTAIN A DIALOGUE WITH THEM.

THE FORMER SECRETARY OF ENERGY AND THE DEPUTY MINISTER OF ITALY'S MINISTRY OF INDUSTRY, COMMERCE AND HANDICRAFTS ISSUED A COMMUNIQUE IN LATE MARCH OF LAST YEAR. THE JOINT STATEMENT CALLED FOR EXPLORATIONS OF WAYS IN WHICH ITALY MIGHT SUPPORT THE SSC DESIGN, CONSTRUCTION AND MANUFACTURE OF THE ACCELERATOR AND COMPONENT SYSTEMS. A SECOND ROUND OF DISCUSSIONS TO KEEP THE CHANNELS OF COMMUNICATION OPEN WERE HELD IN MAY AND JUNE. ALTHOUGH IT WAS CLEAR THAT CONSTRUCTION FUNDING FOR THE SSC WOULD NOT BE FORTHCOMING FOR FY89, SEVERAL ITEMS SHOULD BE NOTED. DURING HIS DISCUSSIONS IN EUROPE IN JUNE, MR. BRADLEY FOUND THAT A NUMBER OF THE EUROPEANS ARE NOW REFERRING TO THE SSC AS COMPLEMENTARY RATHER THAN COMPETITIVE TO THEIR PROPOSED PROJECTS, AND HE

RECEIVED INDICATION THAT LETTERS OF INTEREST WOULD BE SENT FROM SOME OF THE EUROPEAN COUNTRIES AFTER FURTHER DELIBERATIONS. IN RESPONSE TO AN INVITATION FROM SOUTH KOREA, I LED A DELEGATION THERE IN MAY AND MET WITH THE ASSISTANT MINISTER FOR R&D COORDINATION OF THE MINISTRY OF SCIENCE AND TECHNOLOGY, THE PRESIDENT OF POHANG UNIVERSITY AND SEVERAL OFFICIALS OF INDUSTRY. I TOOK THE OCCASION OF THIS TRIP TO REVISIT JAPAN FOR STATUS BRIEFINGS AND TO LEARN MORE ABOUT THEIR CONSENSUS BUILDING PROCESS.

IN THE INTERVENING MONTHS, GIANT STEPS HAVE BEEN TAKEN ON THE DOMESTIC SIDE OF THE SSC PROJECT. CULMINATING A NEARLY TWO YEAR EXTENSIVE COMPETITIVE PROCESS, A SITE NEAR DALLAS-FORT WORTH, TEXAS WAS CHOSEN. A CONTRACT WITH UNIVERSITIES RESEARCH ASSOCIATION, EG&G, INC. AND SVERDRUP CORPORATION WAS NEGOTIATED AND SIGNED FOR THE MANAGEMENT AND OPERATION OF THE SSC LABORATORY. FURTHER, SIXTEEN INDUSTRIAL PARTICIPANTS WERE SELECTED TO BEGIN THE FIRST PHASE OF THE MAGNET INDUSTRIALIZATION PROGRAM.

DURING THIS SAME PERIOD, WE DID CONTINUE TO FOLLOW UP ON INTERNATIONAL ACTIVITIES ALREADY BEGUN. MY VISIT TO SOUTH KOREA LED TO A LETTER FROM THE MINISTER OF SCIENCE AND INDUSTRY FROM WHICH I QUOTE AS FOLLOWS: " WE ARE INTERESTED IN WHAT DR. DECKER HAD TO PRESENT ON THE SUPERCONDUCTING SUPER COLLIDER AND THE OPPORTUNITIES FOR INTERNATIONAL PARTICIPATION IN THIS MAJOR SCIENTIFIC UNDERTAKING. AS THIS PROJECT WILL BE OF GREAT IMPORTANCE TO THE WORLD AS A WHOLE, KOREAN SCIENTISTS WILL BE AMONG THE FUTURE USERS OF THE SSC. AS SUCH, WE WOULD ALSO WISH TO BE AMONG THE INTERNATIONAL PARTICIPANTS IN ITS CONSTRUCTION."

IN OCTOBER, DR. HESS WAS A DELEGATE TO THE FINAL NEGOTIATIONS AND ULTIMATE SIGNING OF THE EXTENDED SCIENCE AND TECHNOLOGY AGREEMENT WITH INDIA. ONE OF THE TWO NEW INITIATIVES IN THIS EXTENSION IS THE PROVISIONAL AGREEMENT THAT INDIA WILL PARTICIPATE IN THE SSC CONSTRUCTION THROUGH UP TO $50 MILLION OF IN-KIND CONTRIBUTIONS, PROVIDING THE U.S. GOVERNMENT COMMITS FUNDS TO THE CONSTRUCTION.

ADDITIONALLY, THERE HAVE BEEN INQUIRIES FROM OTHER COUNTRIES INCLUDING SWITZERLAND, FINLAND, AND SPAIN THAT INDICATE SUBSTANTIAL SUPPORT COULD BE FORTHCOMING. AT PRESENT, A TEAM OF SCIENTISTS FROM THE SSC LABORATORY CONTRACTOR, ITS OVERSIGHT COMMITTEE, AND THE HIGH ENERGY PHYSICS ADVISORY COMMITTEE ARE IN JAPAN HOLDING UNOFFICIAL, BUT VERY SIGNIFICANT, DISCUSSIONS WITH JAPAN'S HIGH ENERGY PHYSICS COMMUNITY ON POSSIBLE WAYS OF COLLABORATION. IT IS ESSENTIAL TO DEFINE THE TECHNICAL SCOPE OF THEIR POSSIBLE PARTICIPATION AS EARLY IN ADVANCE OF FORMAL PROJECT APPROVAL AS POSSIBLE TO ENSURE PROPER INTEGRATION WITH THE REST OF THE PROJECT. IT IS ALSO ESSENTIAL TO ENCOURAGE THE ENTHUSIASTIC SUPPORT OF THE JAPANESE SCIENTISTS BECAUSE STRONG ENDORSEMENT AT THIS LEVEL IS ALMOST CERTAINLY A PREREQUISITE FOR JAPANESE PARTICIPATION. WE ANTICIPATE OTHER REQUESTS FOR SUCH TECHNICAL DISCUSSIONS FROM OTHER POTENTIAL PARTICIPANTS.

I HAVE BEEN ASKED TO COMMENT ON THE IMPACT THAT PROPOSED LEGISLATION ON NON-FEDERAL PARTICIPATION WOULD HAVE ON NEGOTIATIONS FOR CONTRIBUTIONS TO THE SSC. WE MUST LOOK FIRST FOR FLEXIBILITY.

WE ANTICIPATE A NUMBER OF COUNTRIES CONTRIBUTING ONCE FUNDING FOR CONSTRUCTION IS APPROVED BY THE CONGRESS. WHILE THE FY 1990 BUDGET PROJECTIONS ASSUME ONE-THIRD COST-SHARING FROM NON-FEDERAL CONTRIBUTIONS, WE WOULD PREFER TO HAVE THE SECRETARY OF ENERGY DETERMINE WHAT IS AN ADEQUATE AMOUNT OF FOREIGN PARTICIPATION. WE WILL, OF COURSE, CONSULT WITH CONGRESS AS THE INTENTIONS OF THE COUNTRIES ARE LEARNED THROUGH MORE FORMAL TALKS. ONCE FUNDS ARE APPROPRIATED FOR CONSTRUCTION, ARMED WITH THE CHARTER WE HAVE AT PRESENT TO OBTAIN THE MAXIMUM COST-SHARING, WE BELIEVE WE CAN PROCEED WITH MORE DETAILED NEGOTIATIONS AND DEVELOP AN ESTIMATE OF THE TOTAL EXPECTED CONTRIBUTION FOR THE SUBCOMMITTEE. WHILE THE PROPOSED LEGISLATION DOES NOT REQUIRE A MINIMUM LEVEL OF PARTICIPATION IN THE PROJECT, IT MUST BE MADE CLEAR THAT A REQUIRED MINIMUM WOULD BE VERY DETRIMENTAL TO THE U.S. NEGOTIATING POSITION.

AT THE SAME TIME THAT WE LOOK FOR FOREIGN CONTRIBUTIONS, WE ALSO HAVE A COMMITMENT TO HELP BUILD UP AMERICAN INDUSTRIAL CAPABILITIES IN THE TECHNOLOGIES OF THE SSC. THE DEPARTMENT'S POSITION IS TO MAINTAIN A SIGNIFICANT RESERVE OF THE MAJOR COMPONENTS FOR U.S. INDUSTRIES. WE SUGGEST THAT THE LEGISLATION SHOULD NOT CARRY PRESCRIPTIONS ON WHAT PERCENTAGE OF MAJOR SYSTEMS ARE AVAILABLE FOR COST-SHARING, THIS WILL PERMIT THE SECRETARY OF ENERGY THE MAXIMUM FLEXIBILITY TO NEGOTIATE THE OPTIMUM POSITION FOR BOTH THE U.S. INDUSTRY AND FOREIGN GOVERNMENTS IN THESE AREAS. LATER THE SECRETARY COULD ISSUE PROCUREMENT RULES LIMITING BIDDERS TO U.S. COMPANIES FOR THE COMPONENTS SO SPECIFIED. SUCH ACTIONS AT THAT TIME WOULD MAINTAIN THE NECESSARY FLEXIBILITY TO WORK WITHIN ALL THE POSSIBLE PERMUTATIONS OF DOMESTIC AND FOREIGN PRODUCTION COMBINATIONS.

TO PURSUE INTERNATIONAL PARTICIPATION, I HAVE STATED THAT THE COMMITMENT OF THE CONGRESS TO CONSTRUCTION IS NECESSARY. IN JAPAN, A MAJOR HIGH ENERGY PHYSICS MACHINE, THE TRISTAN ACCELERATOR AT THE JAPAN HIGH ENERGY PHYSICS CENTER (KEK), WAS AWARDED THE DISTINCTIVE TITLE OF "NATIONAL PROJECT", AN INDICATION OF THE PRIDE AND COMMITMENT OF THE GOVERNMENT OF JAPAN TO THE PROJECT. THE PEOPLE'S REPUBLIC OF CHINA BESTOWED THE TITLE "KEY PROJECT" TO THEIR BEIJING ELECTRON POSITRON COLLIDER (BEPC) TO INDICATE THE PRIORITY AND COMMITMENT CHINA HAS TO ITS COMPLETION. BOTH PROJECTS HAVE INTERNATIONAL PARTICIPATION, INCLUDING THAT OF THE UNITED STATES. IT IS ABSOLUTELY ESSENTIAL TO SIGNAL A FIRM U.S. COMMITMENT TO ASSURE FOREIGN CONTRIBUTORS THAT WE WILL SEE THE PROJECT THROUGH TO THE END OF ITS OPERATING LIFE. ANY PROVISION OF PROPOSED LEGISLATION THAT CONTRIBUTORS WOULD RECEIVE CASH AND IN-KIND CONTRIBUTIONS BACK IN THE EVENT THE PROJECT IS CANCELLED OR IF FUNDS ARE NOT APPROPRIATED TO COMPLETE CONSTRUCTION OF THE FACILITY SENDS THE WRONG A SIGNAL TO ALL POTENTIAL CONTRIBUTORS. IT IS THIS ADMINISTRATION'S POSITION THAT THIS PROJECT SHOULD BE NOT BE UNDERTAKEN UNLESS IT IS UNDERSTOOD FROM ITS INCEPTION THAT IT WILL BE COMPLETED. IT IS ALSO OUR POSITION THAT STATE AND FOREIGN CONTRIBUTIONS TO THIS PURE SCIENCE ENTERPRISE WILL HELP TO ASSURE THAT, INDEED, THE PROJECT IS BROUGHT TO A SUCCESSFUL CONCLUSION.

IN SUMMATION, THE DEPARTMENT SUPPORTS THE INTENT OF THE LEGISLATION. THE DEPARTMENT HAS, HOWEVER, WORKED VERY HARD TO OPTIMIZE OUR PLANS FOR BUILDING THE SSC, INCLUDING THE ISSUE OF NON-FEDERAL COST-SHARING. WE WILL SEEK MAXIMUM NON-FEDERAL CONTRIBUTIONS AND ESTABLISH PROCUREMENT GUIDELINES TO ENSURE SIGNIFICANT INVOLVEMENT OF AMERICAN INDUSTRIES. TO THIS END, WE ASK FOR THE BROADEST GUIDELINES FOR LEGISLATION ON NON-FEDERAL PARTICIPATION IN THE SSC. WE WILL CONTINUE TO WORK CLOSELY WITH THIS SUBCOMMITTEE AND ITS STAFF TO

DEVELOP LEGISLATION THAT SATISFIES OUR MUTUAL GOALS. DR. HESS, MR. BRADLEY AND I WOULD BE PLEASED TO ANSWER ANY QUESTIONS YOU MAY HAVE.

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Mr. HALL. Dr. Bradley, do you or Dr. Hess care to make any lead-in statements, or do you want us just to fly into you here and now or what are your wishes? We'll be glad to recognize you for a minute or two minutes or anything you want to add or anything you want to differ with Dr. Decker on?

Mr. BRADLEY. No, I have learned a long time ago not to dicker with Dr. Decker.

Mr. Chairman, I would like to thank you and your Subcommittee for the letters that were provided to the team that went to a number of the capitals to discuss possible participation in the SSC. These letters coming from you were very helpful in opening doors and setting the right environment for our discussions and thank you on behalf of the Department.

Mr. HALL. And we, once again, thank you for your appearances before our Committee and the good help that you've been both during those appearances and in-between the appearances, we've always felt free to call on you and your folks for anything we need.

We had a group here yesterday called the Western Union or Western Alliance—European Alliance, and among them were, of course, members from the United Kingdom and particularly the group from Italy, you, Dr. Decker, referred to your visits or some discussions that Italy might support the SSC. And of course, with Professor Rubia as a catalyst over there and one of the world leaders we found some interest on the part of these elected officials—one was a senator, I think, from Italy and they had two others—but they were about a five member delegation from Italy that showed great interest in this.

Did you find that same interest in your visits?

Dr. DECKER. Mr. Bradley is the one who has made the visits to Italy and perhaps he can speak to that better than I can.

Mr. BRADLEY. Yes, Mr. Chairman, we found a great deal of interest by the Italian government and industry officials in the SSC. But I think that interest, which is real, is also—there's a caution in the sense that they feel that it's very necessary for us to get construction funding before they can go into serious negotiations.

Mr. HALL. Dr. Decker, on page two of the bill—I don't know if you've had an opportunity to see the bill that I introduced, it's cosponsored by others.

On page two, where they deal with foreign participation there, where it says—it alludes to "...an amount

not less than 15 percent nor more than 30 percent

of the total fixed cost of the project...," does that give you enough flexibility or how would you better word that if you're not satisfied with that wording?

Dr. DECKER. I think that that wording does provide us with a reasonable amount of flexibility. I would be very concerned if the words were to change in a way that put a floor on the amount of foreign contributions that we have to have.

Mr. HALL. You'd be concerned if they made it more than 30 percent?

Dr. DECKER. I think the wording right now—I don't have it before me—said that the Secretary shall seek—

Mr. HALL. "...shall seek to obtain commitments for foreign contributions to the Superconducting Super Collider project...of an

amount not less than 15 percent nor more than 30 percent..." Does that give you some heartburn?

Dr. DECKER. I certainly find that that's more acceptable than having wording that would provide a hard floor, that we had to have a certain amount. I think that the wording softens it by saying that the Secretary "shall seek."

Mr. HALL. Well would it help any if we should put in there—add the word "and obtain."

Dr. DECKER. That wouldn't help.

[Laughter.]

Mr. HALL. Being from the state that is very interested, among others, in getting this thing underway, we want to give you all the friendly direction we can.

Dr. DECKER. Yes. Honestly our concern is that a hard specification on the amount of foreign participation will put us in a very difficult negotiating position with other countries, that they would really have a lot of leverage in their negotiations with us.

Mr. HALL. You alluded to the refund provision on page four of the bill. I think that was in last year's bill, if I'm not mistaken.

How would you reword that, I guess, is my question?

Dr. DECKER. To be honest with you, I haven't thought about rewording it. The concern that we have is that all partners—the State of Texas, of course, is one of them— and other foreign countries would want exactly the same guarantees from the U.S. Government that we would be providing to the State of Texas. And that would be, I think, a bit unprecedented.

It also seems to me to send a bad signal, that the United States might be an unreliable partner in this project. And I believe that, if we start this project, in fact, we have to be committed and we have to carry through with it, otherwise, as I indicated in my oral remarks, I believe this whole idea of jointly building some of these very expensive scientific facilities and avoiding duplication in the world will go down the drain, and that would be a shame.

Mr. HALL. I would like to get with you for some rewording on that, if it would take it—that was in last year's DOE authorization bill and it was in the language that passed the House and I think the Senate addressed and knocked some of that language out, so obviously there's a difference of opinion about the percentages. At that time, though, the percentages were different that we were talking about.

And I wonder how—what problem that gave you? Last year the percentages said the Secretary shall seek to obtain but the percentages were not less than 25 percent nor more than 33-1/3. Did that put you in too much of a straightjacket there, just to give you 5.5 or 6 percent leeway there—8-1/3 percent leeway.

Dr. DECKER. I think that one of the difficulties that we ran into—I believe there was also a specification on the percentage of subsystems and components that were to be reserved for U.S. industry—was that the combination of the percentage of foreign in-kind contributions we were likely to get, plus the restriction for the amount to be reserved for U.S. industry were incompatible. Having looked through what are likely areas that we could expect in-kind contributions from other countries, it just looked like those two provisions were incompatible and we really couldn't make it work.

Mr. HALL. Do you think the outside limit of 30 percent is too little, too much or about right?

Dr. DECKER. On the outside—if I had to guess I would say that that outside limit is reasonable.

Mr. HALL. Okay. Then obviously we need to do some work on the refund provision and I will at a later time ask you and George and Dr. Hess to give us some help along that line on what you—because we do need to have a united thrust and really we don't need anything that causes any anxiety that we're not for real or that we're in for another Clinch River or anything like that.

On page two of your testimony you state that—and I quote: "...before we could expect a commitment from..." foreign governments "...to participate in the SSC, a commitment from the entire U.S. Government to the project was essential."

I don't know if we can get a commitment from the entire U.S. Government, but in the eyes of potential foreign contributors what would you say constitutes a commitment by the U.S. Government? Tell us exactly what you mean there for the record.

Dr. DECKER. I think it means two things, one of which we have, and that's President Bush's support for the project, as he stated in his message of priorities.

Secondly—and I think this is very important—we do need an appropriation of construction funds from the Congress and the sooner we get that, obviously, the better off we'll be.

We have certainly found that those are the two obstacles in our discussions with other countries and we must have both of those.

Mr. HALL. You think that the level that we're seeking this year gives them that continued comfort that we're for real?

Dr. DECKER. Yes, I believe that the President's budget request, a total of $250 million for the project, would give foreign countries confidence that, in fact, we're for real.

Mr. HALL. You mention Korea and you note a Korean letter that states that they'd wish to be among the international participants in the SSC construction.

Did you take that to mean that they'd like to contribute or to trade us some Korean cash in hand paid for part of this accelerator or that they simply want to bid on the construction contracts?

Dr. DECKER. I can understand that wording is a little ambiguous, but from my discussions with them it is my feeling that they wish to make a contribution to construction of the accelerator.

Mr. HALL. What would be the likelihood that our country—in the event we get little or no foreign participation, that we could build it and simply charge fees to the foreign scientists for using the SSC, particularly if their country didn't contribute significantly to the project? It looks like that's another avenue for income or sustaining income for this facility.

Has CERN or any other international facility ever threatened our scientists with user fees? Or do they charge user fees? I'm not aware—

Dr. DECKER. Other accelerator facilities in the world do not charge user fees. This is an international agreement—maybe not a written agreement, but the International Committee on Future Accelerators certainly has this as a policy, and I think all of the

major countries that participate in high-energy physics belong to that.

I believe that CERN has made some mention of the possibility of charging user fees.

But let me just say that our experience with running large scientific facilities in general, just domestic facilities, has been that charging user fees does not really work to support such facilities. There's just too much uncertainty in what you will take in in a year in user fees and all these facilities have fixed operating costs. So we have found even with our domestic facilities that charging user fees is just not a viable approach.

Mr. HALL. I think the Congressional Research Service has done some studies that show that historically international contributions to high-energy physics facilities have been in the range of 3 to 5 percent of the total project costs. Now what would make the SSC any different?

Dr. DECKER. I think we're entering a new era. Now obviously the SSC is a much larger facility than any that has been built before for high-energy physics. It is clear that that is the kind of facility that one has to build to move this field forward. Other countries, I think, recognize that they are not individually going to be able to build a competing facility.

So I really think we've entered a new era in high-energy physics where in fact we are going to have to work more closely with other countries and provide larger contributions to these international projects.

Mr. HALL. I guess my next question should be how much has the United States contributed, for example, to the construction of CERN or DESY or any of the other international colliders?

Dr. DECKER. I don't know the totals that have been contributed, perhaps Dr. Hess does.

Mr. HALL. Dr. Hess?

Dr. HESS. We have not contributed anything directly to the construction of the accelerator, but in the development of detectors to be used at the accelerator at CERN, we probably have a total of $50 million invested now.

Mr. HALL. Anything in DESY?

Dr. HESS. Yes, in DESY we have one major experiment going forward and that is probably $15 or $20 million invested. But nothing in the construction of the DESY accelerator.

In response to the question you asked earlier, the DESY accelerator is being funded at the level of about 15 percent from other countries, so there is one precedent which would make one think that what we are attempting to do on the SSC may work out.

Mr. HALL. Dr. Decker, based on what you know about foreign interest in the project, what portion of the contributions do you think will be to the base project and what portions will be to the first detector, say? Or do you have a breakdown, can you give us that type breakdown?

Dr. DECKER. I don't know that I can give you that kind of breakdown. I think we sort of guess that foreign contributions to the first complement of detectors might be on the order of a couple hundred million dollars, in the range of $100 to $200 million is our guess.

And we are assuming at this time, of course, a total non-Federal contribution to the project—which includes the first complement of detectors—of $1.8 billion.

Mr. HALL. I'll pick up in a minute, but I just asked Congressman Barton a foolish question, I asked him if he wanted to make a statement about the Super Collider. It's in his district, it's being built right out behind his acreage there and Joe has been a major thrust in the successful pursuit by our state of encouraging the Department of Energy and he's a former member of this Committee and one of the leaders of the construction.

Congressman Barton, my colleague from Texas.

Mr. BARTON. Thank you, Mr. Chairman.

I want the record to show that my acreage is a lot that's 100 feet wide and 150 feet deep.

[Laughter.]

Mr. HALL. And it is not paid for.

Mr. BARTON. It is not paid for.

Mr. HALL. You would have paid for it if we got the pay raise.

Mr. BARTON. That's right. Another 27 years and it will be paid for.

Mr. Chairman, I do appreciate the opportunity to interrupt this important panel, all of whom I know well and they're good friends of mine. I have a statement I'll submit for the record, let me just very briefly state that I think your bill is an important bill. I was proud to be a co-sponsor of the legislation. I think it is a good step forward to ensuring that there be international cost sharing.

As you know, our State of Texas has put up a billion dollars. And the people that are testifying before you right now have engaged in discussions with our international allies: they have signed one agreement with India and are in negotiations with other countries, I think principally Korea right now is interested.

The only thing that I would say as a caveat to the bill—and I think it's an important piece of legislation—the percentages that are in the bill I hope that the Congress uses as guidelines and not absolute mandate percentages because that can tie our negotiations overseas.

But it is a good step in the right direction and I'm proud to be a sponsor and I will submit my written statement for the record. And I yield back graciously to the Chairman.

Mr. HALL. Thank you, Mr. Barton.

I think, Dr. Decker, to get back and talk a little more about foreign contributions to the project itself or to the detectors—we get input that there's more international interest—or maybe I should say less international interest in contributing to the base construction than to some of the more glamorous aspects like the detectors and coming in with some of the wherewithal after we've done the base work on it.

Give us the benefit of your opinion, Bill, or either of you, on the dangers in that and how we can overcome that.

Dr. DECKER. I think that, you know, you see a lot of interest in contributing to the detectors and that has sort of been a traditional way in which international collaboration has taken place in high-energy physics.

If there are any dangers, I'm not quite sure what they are except that we want to make sure that we retain enough of the detector development and operation here for our own scientists. We want to make sure that there are enough detectors and participation in those detectors available to our own scientists and students.

Mr. HALL. Obviously there's going to be greater interest in the detectors and foreign participation and contributions to the detectors than to the base.

Talk to me a little bit about the present construction schedule. Given the present construction schedule, whatever it may be, when would you expect the contributions to the detectors to begin to be made and when would you need them to begin to be made?

Dr. HESS. Mr. Chairman, we are going to start organizing detector teams this coming year. Dr. Schwitters, the new Director of the SSC Laboratory, will put out a call for letters of intent after a short time, trying to put such teams together.

After those teams are organized, then you will start getting an idea about what the international participation is, the contributions are, and it will probably be not before about 1992 when you have final designs and pieces assigned to different groups and then international involvement in starting to build parts of the detector, build equipment for the thing. Probably '92.

Mr. HALL. Let's get right to the biggies on it. What's your idea—give us the benefit of your thinking or your attitude toward participation by the Soviet Union or the People's Republic of China in the SSC?

Dr. DECKER. Well we have agreements with both of those countries in high-energy physics at the present time. Their scientists do work at our accelerators and we have some of our scientists working at their accelerators as well. They have certainly shown some interest, of course, in what we are doing in proceeding toward the SSC. I would expect that their scientists would wish to participate in experiments. Once the accelerator is completed, they probably would want to participate in the development of detectors at the very least. They have participated in the past in some of our detector development, in fact.

Mr. HALL. I think we'll have some other questions and hopefully Mr. Barton will have some questions, but why don't we let Tom Luce come and testify now and then we'll have some questions that will be in conjunction with his testimony we may want to ask you all about.

We'll recognize Tom Luce as Chairman of the Texas National Research Laboratory Commission and a good right arm of my friend, Governor Clements, whose duties are to administer the $1 billion authorization in money by the voters of the State of Texas and whose duties are to deliver the site.

Mr. Luce, we recognize you to give your testimony in any manner that you want to: you can either summarize it or put your entire statement into the record as you choose. We recognize Tom Luce.

Dr. DECKER. Mr. Chairman, do you wish us to remain here at the table or—

Mr. HALL. Yes, if you would, and then we'll get right down—I think it will get everybody out of here quicker and we might can

ask you some questions that Mr. Luce testifies about that would be helpful for the record.

And let me say this: Don't be dismayed by the lack of members here because I see in the audience in here staff and it's probably more important for them to understand the testimony you give than it is for the members—and they are in other hearings now—but members come and go and staffers come and stay and they write most of the work.

[Laughter.]

Go ahead, Mr. Luce.

STATEMENT OF THOMAS W. LUCE, III, CHAIRMAN TEXAS NATIONAL RESEARCH LABORATORY COMMISSION

Mr. LUCE. Thank you, Mr. Chairman.

My prepared testimony, which I would like to submit for the record—

Mr. HALL.—which will be done without objection.

Mr. LUCE.—principally covers three different areas: the first is the national interest in proceeding with construction of the SSC; second, the role that the State of Texas can play and will play in the funding of the project, and, foreign participation in the SSC.

I might take just a minute to address the issue of national interest, since I am asked that question from time to time in my role as Chairman of the state agency dealing with the Super Collider.

I sincerely believe that nothing less than our world leadership in science and related technology is at stake in the decision on whether to proceed with the SSC. Our country's efforts to solve a host of problems ranging from economic competitiveness to environmental problems will depend upon that scientific leadership.

And I submit, as I did in my testimony, that as you grapple with the question of what will be the spin-offs from this project, I believe an analysis will reveal that prior basic research in high-energy physics has had enormous benefit to the country in numerous fields, whether it be medicine, whether it be supercomputers—

Mr. HALL. Kind of like SDI: if we never really achieve it, the road there will spawn a lot of benefits to the country.

Mr. LUCE. Well and I think this is the same idea.

And I think also, Congressman, that I would point out that we have already been able to identify in—just the preliminary work done on this project to date has already yielded some spin-offs. In other words, we haven't even started construction and we're already looking at spin-offs.

We've had—in the field of diagnostic machines in medicine, through the development of better magnets we have been able to improve these machines.

There's now the thought that the tunneling techniques that will be used in this project will enable us to advance in that field.

We have advancements in superconducting cable that will play a role.

Also, just the hardware and software that will go into this project will advance us in the field of supercomputers.

So I think we've already seen that there will be enormous benefits to this project, and I think that if we do not proceed we will begin to yield that scientific leadership.

I wanted to speak though today more, given the nature of your bill, Congressman Hall, to the role of Texas in the construction of the SSC.

As you know, the people of Texas feel so strongly about the importance of the SSC that they voted by an overwhelming number, 62 percent as a matter of fact, to authorize the expenditure of this billion dollars for the project.

And I have been questioned from time to time about that billion dollars and had people say to me Well gee that's understandable, since the site is going to be in Texas, that the people of Texas would support it. But I would point out that they voted 62 percent for that before they knew where the site was going to be.

And second I would point out that Congress has already appropriated about $125 million for this project. It is our estimate to date that less than 1 percent of that money has been spent in the State of Texas. So this is not a Texas pork barrel construction project, this is a project which the people of Texas feel is vital for the entire country.

And in that light, I wanted to say that we believe that we should grapple with this issue of foreign participation in the way that would maximize the ultimate contribution we receive from a foreign government and the terms and conditions of that contribution.

We believe that if Texas is allowed to, in effect, front load our contribution to the project—step up to the plate, if you will, and advance money in FY90 and FY91, as you heard the representatives from the Department of Energy, realistically it's going to take until FY92 for there to be significant contributions from foreign governments.

We all know that it's a very time-consuming task to negotiate agreements with foreign countries. That's going to take time.

There are also issues that need to be debated regarding intellectual property issues—what aspects do we want foreign governments to participate in—I suspect there will be debate and discussion regarding those issues.

Texas, as a result, is willing to say we'll step up to the plate and provide more money in the first two years than would ordinarily be our pro rata share to help facilitate this project. And we think that is the best way to maximize what we will ultimately receive.

And I would say also, Congressman, in response to the question about the refund: one of the reasons that we feel strongly that the language in your bill and Congressman Barton's bill should be in the final draft relates to the fact that Texas is coming forward and saying we will advance more than our fair share in the first two years. And it seems to me that one of the givens that we have to have to be able to do that is the ability to have that money refunded, since we have give more than our pro rata share. So we think the refund provision is very important.

We would also suggest for your consideration that in your bill in the section dealing with non-Federal contributions or foreign participation that that be modified so as to in effect count the Texas contribution as a non- Federal contribution. In other words, in the

first two years it, we submit, will be very difficult to be gaining foreign participation and we ought to be counting towards Section 2 the money that is put in by the state. It seems to me that that would facilitate the construction of the project and we would suggest that that modification be made.

In closing, let me say that we are committed to this project. We believe that with the adoption of the refund language and with a vote by Congress to authorize construction funds, that Texas is prepared to step up to the plate and come forward with its—more than its fair share of money.

And with that I'll close and respond to any questions you may have, Congressman.

[The prepared statement of Mr. Luce follows:]

Testimony

of

Thomas W. Luce III

Chairman of the Texas
National Research Laboratory
Commission

before the

Subcommittee on International

Scientific Cooperation

of the

House Committee on

Science, Space, and Technology

March 8th, 1989

Mr. Chairman, Members of the Committee, it is a pleasure to appear before you today to testify concerning the Superconducting Super Collider (SSC). I am the Chairman of the Texas National Research Laboratory Commission (TNRLC), the state agency which is responsible for the State of Texas' participation in the development and operation of the SSC.

My prepared testimony today will focus on 3 important issues:

1. The national interest in proceeding with construction of the SSC;
2. The role of the State of Texas in funding the construction of the SSC; and
3. Foreign participation in the SSC.

National Interest in Commencing Construction of the SSC

As Chairman of the TNRLC, I am asked from time to time to justify the commencement of construction of the SSC at a time when every expenditure in the Federal budget must be scrutinized and prioritized.

First, let me say I believe that nothing less than our world leadership in science and related technology is at stake. Our country's efforts to solve a host of issues ranging from economic competitiveness to environmental problems will depend on our commitment to maintaining this leadership.

While we cannot predict with certainty the exact applications which will flow from the construction and operation of the SSC, history tells us there will be numerous applications of enormous importance.

Throughout history, pure or basic scientific research projects such as the SSC have laid the groundwork for the development of technologies that have improved the quality of human life.

Basic research led to the discovery of the electron in 1897, which in turn led to the development of the transistor, microchips, and television.

In the last 2 decades, all of us have been impacted by the basic physics research of the 1920s; applications of quantum mechanics have included the utilization of microchips in personal computers and laser beams in compact disc players. All of these products are derived from our understanding of the behavior of individual electrons and atoms.

Proton and heavy-ion accelerators, originally built for physics research, have been used in medical therapy for over 25 years. In the diagnosis of illness, Magnetic Resonance Imaging (MRI) and CAT scans, which utilize superconducting magnets, enable doctors to see inside the body and determine the precise location and size of tumors. This once arcane medical practice impacts 100 million Americans and is now a billion dollar industry.

Fermilab is currently building an accelerator for the Loma Linda University that will be used for the treatment of cancer.

Positron Emission Therapy (PET) scans are now being used to distinguish the 2 major types of cancerous breast tumors.

It does not take much imagination to conclude that future research in the field of high energy physics could some day help us to conquer cancer.

Today x-ray beams from electron accelerators are being used by industry to produce the next generation of computer chips that will be at the heart of future super computers.

Accelerators are also being used to remove noxious chemicals from smoke stack emissions.

As a result of these examples and many more, it is clear that a large portion of U.S. technology today owes its existence to the development of modern accelerators and related technologies. Past investments in basic research of the interior of atoms have been repaid 100 times over in terms of new technology, new jobs, enhanced national security, and advances in medicine. In pure financial terms, it is easy to see why observers estimate that approximately 1/3 of our gross national product (GNP) is based on our knowledge of the atom.

In addition to the past history of the development of applications from basic research in the field, today - even before we have had a ground breaking ceremony in Ellis County, Texas - research for the SSC has already begun to yield high technology spin-offs.

The spin-offs to date include:

- Better magnets for medical diagnostic machines using magnetic resonance imaging, a method of looking inside the human body, that promises to be even more useful than x-rays and CAT scans.

- More efficient techniques for tunneling that could save millions of dollars in the construction of subways.

- A light-weight compact microwave amplifier that could boost the effectiveness of satellite communications.

- A giant coil of superconducting cable that could store

electricity produced by power plants at night when demand is low and release it during the day when demand is high.

- Enhancements in hardware and software that will enable us to remain in the race for leadership in the super computer field.

In addition to the numerous tangible "spin-offs" which we can reasonably expect from our review of historical precedents and the advances which have already resulted from preliminary work on the SSC, there are many intangible benefits which we can expect from the SSC. They include:

- The attraction of many of the world's leading physicists to live and work in the United States as opposed to the "brain drain" the United States would suffer if the center of high energy physics shifts to Switzerland, Japan, or Russia.

- The SSC will be utilized by over 100 American universities, thereby strengthening the research capabilities of universities in every section of the country.

- The SSC will be a visible and tangible commitment by our country to science and technology and thus serve as an inspiration for young people to pursue careers in science; and finally,

- Construction of the SSC will symbolize American determination to

maintain our scientific leadership in the world and remain competitive in the increasingly challenging world economy.

In summary, I submit that we must proceed with construction of the SSC. What is the price of failing to do so? It means we will relinquish scientific leadership in a field that has yielded enormous benefits to our society. It means continuing a trend in our country of short term spending decisions instead of investing in the future. If we are going to bequeath to the next generation a deficit, the least we can do is invest today in a long range project which will yield enormous benefits to that generation.

This is a very rich country, rich in resources and talent. But it still requires leaders of vision to spend today and invest for tomorrow in the right proportion. I am confident the Congress will accordingly invest in the construction of the SSC.

The Role of Texas in the Construction of the SSC

The people of Texas feel so strongly about the importance of the SSC that they voted in a state-wide election by an overwhelming 62% to spend $1 billion to help finance the construction of the SSC.

Surely, you say, why not, since the SSC will be located in Ellis County, Texas. First, it should be noted that Texans voted for this financial package even before the site selection decision was made; and second, virtually none of the $125 million appropriated to date by Congress has been spent in Texas. Most of the money has been spent in California, Illinois, and New York. The SSC is

not a pork barrel project for Texas. To assure that the project is indeed national in scope, Texas has proposed to use $100 million dollars of the $1 billion dollar package to support higher education and physics research at the SSC site and at universities and laboratories throughout the country.

The people of Texas are committed because we see the national interest inherent in this project and on a smaller scale, we see the same type of tangible benefits accruing to Texas and our neighboring states. We see the opportunity to use science and technology to transform our economy from a natural resource and agriculture-based one to an economy based on technology.

As a result of the farsightedness of the citizens of our state, the Commission I head is authorized today to utilize $1 billion to ensure the development of the SSC. What we need from Congress to justify our investment is a decision to authorize construction and to appropriate $250 million for the construction process.

If Congress sees fit to commence construction, we are prepared to be your financial partner.

Texas is willing to pay its fair share to ensure that the non-federal participation goal of 30% envisioned in legislation introduced by Congressman Hall of Texas is met. We believe this goal is obtainable with a combination of participation by Texas as well as foreign countries.

Foreign Participation

If Congress continues to want foreign participation in the development and operation of the SSC, we believe the best strategy to accomplish this objective is to:

(i) demonstrate our commitment to the SSC by Congress voting to spend a significant amount of construction money;

(ii) ask Texas to "front load" for 2 years a portion of its investment.

I believe this strategy will permit us to debate and decide upon the terms and conditions under which we want foreign governments to participate. There are many serious intellectual property issues that must be addressed. In addition, a firm construction commitment by Congress and Texas will demonstrate the inevitability of the SSC project. I sincerely believe this strategy will optimize the amount and the terms of that investment.

Texas feels so strongly that this is the best strategy that we are willing to "front-load" some of our investment for the first 2 years to meet the 30% non-federal contribution requirement.

In this regard, we would propose, Mr. Chairman, that Section 2 of H.R. 1195 be amended to allow the total non-federal contributions to the project to meet the 15 percent and 30 percent requirements of this section. This would allow time for Congress and the Administration to negotiate significant foreign commitments under acceptable terms, while allowing the State to meet the expected non-federal contribution requirement during the early phases of construction.

In closing, I want to thank this Committee for their work in the fields of science, space, and technology. I know you face many difficult choices with a finite amount of funds.

I sincerely believe the SSC can be the most important machine mankind has ever built. I hope you reach the same conclusion.

I would be happy to respond to any questions you may have.

Thank you.

Mr. HALL. Okay. Just really to set the record straight as far as the Texas project, you're not here to testify that it's going to hurt the Texas economy, though, are you?

Mr. LUCE. No, sir, I'm sure not here to say that.

But you know it's interesting, Congressman: I sincerely believe that the greatest benefit to the State of Texas from this project is going to be the intangible spin-offs in terms of the scientists and the work of universities that is going to take place in Texas.

Let me say, the other thing that the State of Texas has suggested, which I think is very important to this project, is that $100 million of the $1 billion be spent in universities across the country in participating—to allow their departments to participate fully in these projects and also to conduct experiments at their own colleges.

It seems to me that that again is one of the intangible benefits here is that it will do so much for our scientific education and for the research universities that are so important to this country.

Mr. HALL. I surely agree with you.

On page three of your testimony you state that the SSC spin-offs would include "...more efficient techniques for tunneling that could save millions of dollars in the construction of subways."

What is the lady's name that is in charge of tunneling, the engineer?

I heard her speak about two weeks ago and she's absolutely sensational.

Mr. LUCE. Priscilla Nelson. I was searching for her name. And you're absolutely correct, she is dynamite, and I wish she was here to amplify on that—

Mr. HALL. Well we may get her here later sometime because she is absolutely just the last word on it.

On page four of your testimony you talk about the brain drain that could occur if the center of high-energy physics shifts to Switzerland, Japan or Russia or somewhere else.

Is it really credible that the center of the research might shift to Russia? You outline Russia there, is that likely?

Mr. LUCE. Well I don't think it's nearly as likely as Switzerland or Japan. I really—from time to time—

Mr. HALL. I wouldn't sell Japan short but—

Mr. LUCE. I wouldn't either. And I think from time to time the Soviet Union has discussed that but I think in their current economic condition it's probably not the greatest possibility. So I certainly would not put it in the same category as Switzerland or Japan.

Mr. HALL. I'll get back to you but I want to recognize Congressman Barton to ask whatever questions for as long as he wants to.

Mr. BARTON. Thank you, Mr. Chairman. I don't have many questions; you're doing a much better job than I in asking the questions.

I might point out you seem to apologize for the lack of members here: I can say with a great degree of authority that the most important member, the Chairman of the Committee, is here and asking the most intelligent questions. So I think this is going to be a good hearing.

I have a question for the Department of Energy officials. I'm not trying to put you on the spot or anything but I got a letter from a scientist last week—a copy of a letter that he wrote to another congressman—and he was concerned about the fact that of the 20 companies that have been certified to submit proposals for the magnet construction only six are American companies. And I believe—I don't believe the other 14 were necessarily all foreign-owned companies but they were at least principally foreign-controlled.

And this gentleman's concern was that, since our scientific community in the past in the other magnets that have been constructed, the other superconducting magnets that have been constructed, have been constructed in-house by Department of Energy scientists at the national laboratories, that we ought to make a real strong effort to have at least the magnet construction program for the SSC be done by a domestic private-sector company.

I don't know if, Dr. Decker, you'd want to comment on that or perhaps Dr. Hess.

Dr. DECKER. Well I think that we are in agreement that a certain fraction of the superconducting magnets should be reserved for U.S. industry to manufacture.

Mr. BARTON. Are you familiar with the—I wish I had a copy of the letter with me, I don't, but—

Dr. DECKER. Yes, I think I've seen a copy of the letter that you're referring to.

Mr. BARTON. Okay.

Dr. DECKER.—at least I'm familiar with it.

Mr. BARTON. What we want, in Congressman's Hall bill, is to foster international cost-sharing and that's a goal that I think the majority of the Congress agrees with—I certainly do, I'm a co-sponsor of his bill.

But I just returned—the reason I was late to this hearing, there is an engineering society convention in town and I went to speak with them, not just on the SSC but I did mention the SSC. And one of their engineering officials stood up and made the comment that it doesn't do much good for the United States to create the research, do the basic research, if the application of that research or the major components of the research are done outside our shores.

And I want you all to be aware of that and I would be more than happy to meet with you or any other officials on this particular letter. I don't have it with me but I thought this would be an appropriate place to answer.

Dr. DECKER. Sure.

Mr. BARTON. A question for Mr. Luce:

First of all, I want to congratulate you on your new position. It's not one that's very well paid, even less well paid than some other positions here in Washington, but you're certainly doing a good job and have got a big job to do.

What is your view down in Austin, the Texas Legislature and our Governor and our Speaker and Lieutenant Governor, if the Congress doesn't vote construction funding this year, how solid is the Texas commitment on the project?

Mr. LUCE. Congressman, I think the expenditure of the Texas funds really is—it's really necessary for Congress to have voted for construction before there would be the support to spend the Texas

funds. I think we need to see a commitment to the project that involves construction. So from our standpoint, I think that's very important.

Mr. BARTON. What happens, Mr. Luce, in terms of land acquisition?

You know, the State has the responsibility to provide the land to the Department of Energy at no cost to the Department. What happens to the plan for land acquisition if the Congress doesn't vote construction funding this year?

Mr. LUCE. That's a good question, Congressman. I think first of all we will not start purchasing this land until Congress authorizes construction of the project. So we may be faced with a situation where land costs continue to march upward if Congress does not step forward this year and authorize the construction of the project.

So we believe the authorization of construction is very important, just as it's important to the foreign countries, it's important to the Republic of Texas, Mr. Chairman. We think that's the reason why you ought to include Texas in that non-Federal portion, since we're the Republic of Texas, you could count us as a foreign contribution.

Mr. BARTON. One final question and then I yield back to the Chair:

What, if anything, has the Texas National Research Laboratory Commission or the Governor's Office or the Department of Commerce in Texas done in conjunction perhaps with the Department of Energy or the State Department to initiate some discussions with our international allies on international cost-sharing. Is there a program that you're beginning to implement or others in the state to help Congressman Hall and others here in the Congress that want to encourage international participation?

Mr. LUCE. Congressman, we have seen the Department of Energy as having a central and primary role in that effort and have felt that we should not directly involve ourselves in that because we don't want to accidentally undermine any negotiating position that the Department of Energy may have.

We are certainly constantly trying to be ambassadors overseas and talk about this project, the importance of this project, the Department of Commerce in Texas has done a lot of that, our universities have done a lot of that. So we are out there, as you might say, stirring up interest but we try very hard to make sure that we're not undermining anything the Department of Energy is doing.

Mr. BARTON. But if the Department, if an executive agency, the Department of Energy or the State Department, or if there was a Congressional delegation that wanted some State of Texas participation in some way, there's no hesitancy to work in a cooperative fashion, is there?

Mr. LUCE. Absolutely not. We stand ready to do anything that Congress or the Department of Energy wants us to do to make this project successful.

Mr. BARTON. I yield back. Thank you, Mr. Chairman.

Mr. HALL. Thank you, Mr. Barton.

Now you're really just standing by waiting for us to show good faith by appropriating some money that would catapult you into buying the land?

Mr. LUCE. That's correct, and in making other—

Mr. HALL. You're just sitting there with these people's land—you know approximately where it's going to be, don't you?

Mr. LUCE. Yes, sir, we do.

Mr. HALL. And we have folks there that have this acreage that it's just like when a valley is condemned for a water project and they don't build the project for ten years, the valley is just held in abeyance there and with very little improvements on levees or fences or barns or improving the soil or putting into practice any practices that are recommended by soil conservation and others, it is really just held in abeyance.

Mr. LUCE. That's correct.

Mr. HALL. So it's important that Congress acts and that they act responsibly and that we act this session.

Mr. LUCE. Yes, sir, and I think not only will that trigger then our land acquisition, that will trigger our ability to place more funds into the project, even more than the land acquisition. In other words, we stand ready even above the land acquisition to participate financially in the project. So you've got a willing partner who is ready to invest as soon as Congress has made that decision.

Mr. HALL. But we've not bought an acre of land there yet?

Mr. LUCE. That's correct.

Mr. HALL. But you have options on it, or—

Mr. LUCE. No, sir, we have no options.

Mr. HALL.—are you even in a position to do that?

Mr. LUCE. No, sir, we're really not in a position to do that. We have a tremendous data bank established, we've done all the field note work, we've done all the preparatory work, the title work. We stand ready to start purchasing just as soon as Congress has acted.

Mr. HALL. Okay. We'll do a little housekeeping work here.

We will put Congressman Barton's full statement in the testimony without objection.

[The material referred to follows:]

TESTIMONY

CONGRESSMAN JOE BARTON
TEXAS, 6th DISTRICT

INTERNATIONAL SCIENTIFIC COOPERATION SUBCOMMITTEE
OF
HOUSE SCIENCE SPACE & TECHNOLOGY COMMITTEE

MARCH 8, 1989

10:00 AM

RAYBURN 2318

THE SSC: AN IMPORTANT INTERNATIONAL PROJECT

Mr. Chairman, I appreciate your asking me to testify today in favor of non-federal participation in the Superconducting Super Collider (SSC) project. I believe this project has the potential to allow the world's most important physics research ever undertaken, and I am proud that the SSC will be located within my Congressional District.

I support and cosponsored your bill, H.R. 1195, to establish certain requirements with respect to the SSC project. I commend you for introducing this legislation and holding today's hearing to separate and debate this all important aspect of the project.

Our state of Texas has agreed to contribute $1.0 billion in cost sharing which demonstrates strong local support for a national project. In addition to local participation, I support international cost sharing since the SSC will have a profound international impact.

I recently attended an International Industrial Symposium on the Superconducting Super Collider in New Orleans which was organized by a consortium of industrial companies, national laboratories, universities and government agencies. Conference attendees numbered over 700 and represented 35 states and 11 foreign countries. This symposium strongly conveyed the message that although Texas is the chosen site, the SSC is a national project -- much like other large projects in the Aerospace and Defense industries where the involvement and benefits are worldwide.

Thus, it is appropriate for an international project with international impact to include international cost sharing. Although I agree Congress should address guidelines for foreign spending, I am reluctant to adopt fixed percentages as anything more than guidelines. Absolute mandates might artificially and inappropriately tie the hands of well-intentioned financial offers.

It is encouraging that even though the United States has yet to make a construction commitment to this all important project, a commitment I believe must be made this year so as to encourage further negotiations with foreign participants; that several nations have, nonetheless expressed their commitments.

For instance, India has signed an agreement to provide $50 million towards the SSC. Officials of Japan, Taiwan, Korea and several Western European nations have held preliminary discussions to financially collaborate on the project; including Italy which signed an agreement to explore a financial commitment.

Some Department of Energy officials have estimated that foreign contributions could add up to a minimum of several million dollars up to a maximum of perhaps half of the project's cost.

In sum, it is obvious that federal outlays can be greatly reduced. Congress must only make a budget commitment and outline the proper balance between the the cost benefits foreign contributions allow while maximizing U.S. technologies and jobs.

Thank you for the opportunity to testify.

Mr. HALL. And we will have the proposed amendment on Section Two of non-Federal participation, Mr. Luce that you have suggested, we'll put that in the record for consideration.

[The legislation, H.R. 1195, appears in the Appendix, page 57.]

Mr. LUCE. Thank you.

Mr. HALL. Now we have the ranking minority member of this Committee and a very important member of this Committee here with us, Congressman Packard, we recognize you at this time for anything that you want to say.

Mr. PACKARD. Thank you, Mr. Chairman. I would just ask you to consent that a prepared statement be entered into the Committee record.

[The prepared statement of Mr. Packard follows:]

RON PACKARD (R-CA)

OPENING STATEMENT

INTER-AMERICAN SCIENTIFIC

COOPERATION ACT OF 1989

MAY 2, 1989

THANK YOU VERY MUCH, MR. CHAIRMAN.

I COMMEND THE CHAIRMAN FOR CALLING A HEARING ON THIS IMPORTANT SUBJECT. TODAY I LOOK FORWARD TO EXPLORING THE MUTUALLY BENEFICIAL INTERNATIONAL SCIENTIFIC COOPERATION BETWEEN LATIN AMERICA AND THE UNITED STATES.

IT IS ESSENTIAL FOR THE NATIONAL SECURITY AND ECONOMIC STABILITY OF THIS COUNTRY THAT STRONG TIES EXIST BETWEEN LATIN AMERICA AND THE UNITED STATES. THOSE WHO WOULD DISMISS THE POLITICAL SIGNIFICANCE OF SCIENTIFIC AND TECHNOLOGICAL EXCHANGE SHOULD CONSIDER THE ALARM IN CONGRESS IF THE SOVIET UNION WERE TO PURSUE SUCH ACTIVITY WITH OUR FRIENDS IN LATIN AMERICA.

SCIENTIFIC AND TECHNOLOGICAL COOPERATION CANNOT BE VIEWED AS DISASSOCIATED FROM OTHER IMPORTANT ISSUES BETWEEN OUR COUNTRIES--TRADE, ENERGY RESOURCES, ECONOMIC DEVELOPMENT, IMMIGRATION, AND UNEMPLOYMENT. BESIDES STRENGTHENING LATIN AMERICA'S INFRASTRUCTURE FOR SCIENCE AND TECHNOLOGY, EXPANDED COOPERATION WITH THE UNITED STATES SHOULD LEAD TO WIDER PRACTICAL APPLICATION OF SCIENTIFIC ADVANCES IN INDUSTRIAL DEVELOPMENT, AGRICULTURAL PRODUCTION, ENVIRONMENTAL PROTECTION, HEALTH CARE, AND MANY OTHER FIELDS.

DURING THE '60S AND '70S, THE UNITED STATES PROVIDED THE RESOURCES NECESSARY TO HELP DEVELOP LATIN AMERICA'S INFRASTRUCTURE FOR SCIENCE AND ENGINEERING; THOUSANDS OF SCIENTISTS WERE TRAINED, LARGELY IN THE UNITED STATES. UNFORTUNATELY, IN THE MID-'70S POLITICAL AND ECONOMIC TURMOIL DISRUPTED THESE COOPERATIVE EFFORTS IN SCIENCE AND TECHNOLOGY.

SEVERAL CHANGES HAVE OCCURRED WHICH MAKE THIS AN APPROPRIATE TIME TO REINFORCE, IMPROVE AND EXPAND THE TRADITIONAL TIES BETWEEN THE LATIN AMERICAN AND THE UNITED STATES SCIENTIFIC COMMUNITIES. RECENTLY ELECTED DEMOCRATIC GOVERNMENTS IN SOME LATIN AMERICAN COUNTRIES HAVE MADE THE GENERAL ECONOMIC AND POLITICAL CLIMATE MORE FAVORABLE TO INVESTMENT THAN AT ANY TIME IN THE PAST 10 YEARS. MANY LATIN AMERICAN COUNTRIES ARE ESTABLISHING SCIENCE AND TECHNOLOGY PRIORITIES.

THEY ARE RAPIDLY EXPANDING COOPERATION WITH EUROPE, JAPAN, AND CANADA IN MANY STRATEGIC FIELDS, AND AN INCREASING NUMBER OF THEIR GRADUATE STUDENTS ARE BEING TRAINED IN EUROPE RATHER THAN IN THE UNITED STATES.

THE UNITED STATES CAN AND SHOULD ASSIST IN PROVIDING THE LEADERSHIP NECESSARY FOR THE DEVELOPMENT OF A STRONG SCIENTIFIC COMMUNITY IN THE WESTERN HEMISPHERE.

THEREFORE, OUR SUBCOMMITTEE IS GLAD TO HAVE THE OPPORTUNITY TODAY TO EXAMINE WAYS TO ENHANCE THE COOPERATION IN SCIENCE AND TECHNOLOGY BETWEEN OUR FRIENDS IN LATIN AMERICA AND THE UNITED STATES. I WANT TO WELCOME THE WITNESSES, AND I LOOK FORWARD TO HEARING THEIR VIEWS AND RECOMMENDATIONS.

THANK YOU.

Mr. PACKARD. But let me simply apologize for not being able to be here for your verbal testimony and indicate my keen interest in this project. It's been—I've had a commitment toward the SSC from its onset. I'm aware that many states, their interest has waned when they found that the competition for the site was over, but that should diminish neither our interest nor our commitment to the importance of such a big high-energy physics project.

Honestly the problem is whether we're going to have the money and where the money is coming from. And as I understand DOE's testimony they've not been too successful getting and seeing interest coming from foreign countries at this point unless we give a significant commitment ourselves, is that correct?

Dr. DECKER. Yes, that's correct. That is a major condition that some of our potential foreign partners have indicated to us.

Mr. PACKARD. And the State of Texas has indicated that they would be putting up some front money until we do get commitments from some foreign countries and, of course, from the government, is that correct?

Mr. LUCE. Yes, sir, we feel that as soon as Congress has voted funds to start construction and we have worked out the adequate language on the refund provisions that we are willing to come forward, and, what we call front-load or give more than our pro rata share in the first two years so that the Department of Energy has more time and can negotiate under better terms and conditions, we believe to maximize the contribution.

Mr. PACKARD. Dr. Decker, when do you expect that DOE would be submitting for construction funds in the budget, in what budget year?

Mr. DECKER. We have requested construction funds in the Fiscal Year 1990 budget. There is a request for $160 million in construction funds.

Mr. PACKARD. That's construction funds, not planning?

Dr. DECKER. There is an additional $90 million requested for research and development, for a total of $250 million.

Mr. LUCE. And Congressman, we feel if that budgeted amount is adopted by Congress, that would be the statement of commitment to the project that would permit Texas to move forward and I believe foreign countries to move forward.

Mr. PACKARD. Dr. Decker, did the President include the full request in his budget proposal?

Dr. DECKER. Yes, he did. In fact, he culled the Super Collider out for special mention in his statement of priorities he provided to Congress.

Mr. PACKARD. Yes, I recall that.

And the next step would be for Congress to include it within their budget?

Dr. DECKER. Yes.

Mr. PACKARD. Mr. Chairman, why don't you go ahead and as we go further, I may have other questions.

Mr. HALL. Yes, I will, Congressman Packard.

Mr. PACKARD. Thank you very much.

Mr. HALL. Now let's just really get right down to the nuts and bolts of it now, let's talk about foreign participation and how realistic we really are on expecting some foreign participation. You

know, people that are going to give you something evidence their donative intent by putting it in your hand.

Do we turn to Japan first, Italy, France, who do you think is the most likely candidate, number one subject for us to zero in on for foreign participation in this Super Collider, Dr. Decker?

Dr. DECKER. I believe that the largest potential partner in this project will be Japan. I think that there are some possibilities in Europe; there is a possibility that Italy will be a significant contributor. I also believe that South Korea could well be a significant contributor to the construction.

Mr. HALL. Okay. Let's go back to your number one draft choice. What have you done with Japan? What conversations have you had with them and what causes you to think that they are a likely candidate and how can we help you?

Dr. DECKER. We've had conversations with Japan on a number of levels that go back over probably four to five years.

The most recent ones—I led delegations to Japan last January that opened formal discussions with them on this topic. I went back and talked with them again in I believe it was May of last year. We got, I thought, rather positive responses from them in those visits. We met with very high- level people. I met with the Minister of Education, for example, who was given responsibility within the Japanese government for dealing with this question.

There is at the present time a group of scientists from the United States led by Dr. Schwitters, who is the Director of the new SSC Laboratory. He is talking with his counterparts in Japan in more detail about possible contributions from Japan.

There has been some conversations with Japanese industry folks who are also interested in seeing their country participate.

So we have had a lot of, I think, positive indications from many different avenues on Japan. It again I think is going to take a fairly high-level approach to Japan to get a significant contribution.

Mr. HALL. Like what?

Dr. DECKER. Probably some involvement by the Secretary of Energy, possibly the President.

Mr. HALL. You talked about India's proposed in- kind contributions. What would be the nature of that? Not that it's terribly important, it couldn't be a very large amount. But what in-kind could India bring to the table?

Dr. DECKER. We're very pleased with the Indian contribution. We don't know the details of it at this point. We need to have some additional discussions with them, but the likely things are, first of all, scientific and engineering help—

Mr. HALL. From India?

Dr. DECKER. From India. They have shown some interest in possibly providing us with some in-kind hardware contributions as well.

Mr. HALL. Let's go back to the Soviet and Chinese interest one more time, I hate to keep hammering on that. And I think Japan is the number one suspect for us because of the bad balance of trade there may be some way we could offset that and approach them along that line.

On the Soviet and the Chinese participation and how credible it is that, one, that the center of research could shift to either of

those areas. I guess that's one of the fears we have as to why we want them to participate in this.

But how about China, what about the likelihood of the new breakthroughs we've had with China and their absolute thirst for technology, it seems like they'd be a very good country to sell some technology to.

Dr. DECKER. I think the Chinese scientists will certainly have a strong interest in this project. There have been some informal discussions with them through our normal exchanges but we have not at this point initiated any kind of formal approach to the Chinese government about their participation.

Mr. HALL. What's your attitude about the Republic of China and them participating in this, how do you feel about it?

Dr. DECKER. Well I guess I could only give you a personal opinion, I don't want to represent the Administration's position on this: But I think that it would be useful to have the Chinese participate in the project; I don't see a significant problem with it.

Mr. PACKARD. Mr. Chairman, may I ask a question?

Mr. HALL. I recognize the gentleman from California.

Mr. BARTON. Thank you.

Some of us were over and visited DESY and CERN, I think that's been mentioned perhaps before, and we sensed at that time a concern for competition between what they're proposing, an expansion of CERN into a larger facility that would be almost competitive with the SSC. Are they planning to go ahead with that expansion or has there been a change in policy in Europe?

Dr. DECKER. They've talked about proceeding with something called the Large Hadron Collider. There is not a commitment on the part of the European countries to move ahead with such a project and I think it will be some time before they could consider such a commitment.

Mr. PACKARD. If we went ahead with SSC, or when we go ahead with SSC, will that further discourage them from going into the enlarged hedron collider?

Dr. DECKER. The two facilities could be viewed as complementary. I think that it is in the interest of high- energy physics and progress in that field that there in fact be more than one center for state-of-the-art high-energy physics research in the world.

Mr. PACKARD. Would that open up a greater possibility of getting some cooperation from them or would they still feel that they need to concentrate their revenues and resources into their own project?

Dr. DECKER. I think that CERN itself might wish to participate in detectors on the SSC at some point, but I think that it's unrealistic to expect that they would contribute to the construction of SSC because I believe that their resources are tight.

Now that's a separate question from whether or not some of the individual countries in Europe would wish to participate in SSC construction. And we have some indication that some of them might be interested in doing that.

Mr. PACKARD. And who is responsible to do the negotiating for the foreign participation in the SSC?

Dr. DECKER. Well that responsibility lies I think principally with Mr. Bradley and myself at the present time.

Mr. PACKARD. So DOE is the one that would be negotiating those agreements and actually establishing agreeable participation arrangements?

Dr. DECKER. Yes. Obviously there will be involvement of other appropriate agencies in the government, so the State Department will clearly have a role, and we will consult and have consulted with other appropriate executive agencies: OMB, Commerce, Defense and so forth.

Mr. PACKARD. And strategy-wise, what would be the thing that would help you the most in negotiating with foreign countries successfully for participation? What could either the Congress or the U.S. government do?

Dr. DECKER. I think the biggest hurdle that we face right now is the one that we talked about a little bit earlier and that is the foreign countries clearly want to see a commitment on the part of the full U.S. government to the SSC project. And that really means the commitment of the present Administration, which I believe President Bush has already demonstrated, and secondly a commitment by Congress and that should take the form of the appropriation of construction funds. Those are our two big obstacles at the present time.

Mr. PACKARD. How far into that do we have to get before it becomes a significant commitment that would be attractive enough for foreign countries, the first year—in other words, if we get the $250 million now in the '90 budget, would that be enough of a commitment?

Dr. DECKER. I believe so.

Mr. PACKARD. Mr. Luce, the figures that I have in terms of participation, it indicates that about 30 percent participation needs to come from non-government resources, the state and foreign countries, business or other private sector—but certainly non-government funds.

You indicated a willingness, Texas having a willingness of front loading. When would you expect that front loading to begin? For example, in my flow chart here of the finances it shows that in the 1990 budget there's still only about $28 million that comes from non-government funds, which is nowhere near the 30 percent. So I don't see a front loading figured in until the '91 budget year. Is that correct? Am I not seeing something here?

Mr. LUCE. Congressman, I don't know what piece of paper you're looking at but I suspect it simply is because we have not yet made the formal commitment to Department of Energy yet, awaiting the action of Congress.

But I am here to say to Congress that we are willing to step forward in FY90—assuming that appropriate terms and conditions can be worked out with the Department of Energy and with Congress, we are willing in Fiscal Year '90 and Fiscal Year '91, to contribute financially a significant amount of money.

Mr. PACKARD. I'm looking, Dr. Decker, at a document from the DOE that has been sent to the State of Texas, as I see it. And it's—the figures really are DOE's figures that show $28 million non-Federal and $250 million of Federal funds for FY90. Either you've not talked together about the front loading aspect or they're not reflected in these figures, is that correct?

Mr. DECKER. Yes. The way that $28 million came about, it was a guesstimate that was made when the Fiscal Year 1990 budget was put together. That was in fact done before we had any opportunity to talk with the State of Texas. And in fact we still haven't gotten to detailed discussions with the State of Texas, but we hope to do that very soon.

Mr. PACKARD. All right.

Without trying to preclude those discussions, again, Mr. Luce, what is Texas willing to forward in terms of front loading in FY90?

Mr. LUCE. Well we are saying that we will help meet the guidelines that are set by this draft legislation that we are discussing here today.

Mr. PACKARD. Which would be 30 percent?

Mr. LUCE. Well what it actually says is 15 to 30 percent.

Mr. PACKARD. I see.

Mr. LUCE. And I think the exact amount that we would contribute in the first year needs to await a complete understanding of DOE's schedule and where our money can best be utilized. I think there are a lot of details that need to be negotiated and discussed among DOE and the State of Texas.

Mr. PACKARD. I understand.

Mr. LUCE. We are scheduled to start that process next Monday, as a matter of fact, March the 13th with the Department of Energy.

I am simply saying though I think I can assure you that we will make a significant contribution in Fiscal Year '90 that would satisfy you and this Committee that we are front loading and doing our fair share to see that the provisions of this bill are met with the amendment I talked about.

Mr. HALL. Would the gentleman yield?

Mr. PACKARD. Please.

Mr. HALL. I think in fairness to Mr. Luce and those that he represents, there's a refund issue that's of import to the participating state in that they don't want to get their money put in there and then the Federal Government abandon or retreat it without some provision for some type refund.

Mr. PACKARD. I understand, and I understand that gives some concern to DOD's ability to negotiate with foreign countries. I understand that and I presume that can be worked out so the language will not work as an impediment to the negotiating process with foreign countries but still protect Texas when they put forward monies that are above and beyond what their normal formula would require. I think that's what we're talking about.

Mr. HALL. Texas can't spend their money until Congress acts or puts some money up or shows some financial intent there. And the foreign participants won't put their money up until some kind of project begins. So my bill, the basis of it, is to try to pull everybody together to get some ground rules that we can go forward with, with your help.

Mr. PACKARD. All right. Thank you.

Mr. HALL. We'll recognize you still, I didn't mean to cut you off, I just wanted to be of some help to my friend from Texas in his answer there. That he'd already answered once when you weren't here.

Mr. PACKARD. Okay. I'm sorry.

Mr. HALL. I wanted you to have the benefit of that knowledge.

Mr. PACKARD. Let me ask, and this may have been answered also, Mr. Luce: the site has been selected. Has anything—what has been done in terms of the site, in terms of acquisitions and other necessary—is that covered in your statement?

Mr. LUCE. Yes, sir, but I can summarize it for you:

Basically we have not—the State of Texas has not acquired the land to date. It's been surveyed, it's been—we have all the data collected, we are ready to proceed. But before we proceed, we need to await the action of Congress to appropriate funds for construction for the project. We are still on schedule to comply with the Department of Energy's request with respect to land acquisition, but I think we are all awaiting construction funding before we spend the money to buy the land. Because otherwise I'm going to be the biggest farmer in Ellis Country—

Mr. PACKARD. I understand.

Mr. LUCE.—in a hurry.

Mr. PACKARD. Thank you, Mr. Luce.

And Mr. Chairman, I apologize for my having to be redundant here today.

Mr. HALL. We appreciate your input.

I guess one thing we need to ask you, Dr. Decker—and let me tell you that I feel good and I think many of the members feel good and I think many of the members on Science, Space and Technology feel good that you're handling this, and Mr. Bradley. I'm very comfortable to work with you. I'd like to know better how I can work with you.

Now let me give you an example. When we went to Europe a year ago or a year and a half ago to look at CERN and DESY and at that time the Department of Energy hadn't exercised the good judgment of selecting my state for the location, we were all in abeyance; we all knew we wanted the project and we'd like to have it in our state but, most of all, we wanted it in our country. And as Congressman Packard has stated, he supports it wherever it is, he didn't say even in Texas but a lot of them are saying that.

So we want to help. And when we went on the visit to Europe to Hamburg and to near the French-Swiss border to look at those accelerators, you were kind enough—or the former Secretary was kind enough to have two of your people meet us at CERN and talk with us with the people over there.

I don't believe that this Committee or any group on a junket have the authority to speak for the United States on a matter on which the duties are delegated to you or to others, but we do want to speak with them, we do want to visit with them, we do need incentive from them, we need some of you with us when we go.

And we're going to have to make some runs over there whether we want to or not. And believe it or not, most Congressmen don't want to take a junket a week, we have better things to do. But this is of peculiar international impact, we have to have some international input, and we're going to be required to go visit with these people to get that input. But in order to have someone that speaks for us with some authority, can we call on you, George, or someone that you appoint, to accompany a group over there?

I don't think we have the authority to speak. We can make inquiry and say nice things about their country and eat their food and, if we didn't ever intend to be appointed the Secretary of Defense, drink their booze—

[Laughter.]

But we need somebody with authority. I think the Department of Defense traveled with us over there and that was helpful. Give me your feelings on whether or not you could do that and would.

Dr. DECKER. Yes, I don't see any reason why we could not provide appropriate level people to make those trips with you and help you in any way that you desire.

Mr. HALL. Who would know your feelings and your positions and your parameters?

Dr. DECKER. Yes.

Mr. PACKARD. Would the Chairman yield for just a moment?

Mr. HALL. Yes, sir.

Mr. PACKARD. I think, in addition, if it would be helpful to have Mr. Hall or myself or other members of the Committee that is of jurisdiction on the SSC go with you when you sit down with countries in the Pacific rim or in Europe or our neighbors to the north or the south to negotiate, I think we would try to make ourselves available, even though we would not want to become the negotiators, we certainly would be more than willing to lend our—what little influence we may be able to take with us in doing that. It may not be necessary, but I think that we would be more than happy if it would help to bring about some contributions and some support from foreign countries.

Dr. DECKER. I very much appreciate that offer.

Mr. HALL. I know that you-all haven't had time to review Mr. Luce's testimony, you've heard it here and he's going to put all of his testimony into the record, but I think I would be interested in your response to the section that he entitled the national interest in commencing construction of the SSC and whether or not—have you had a chance to read that part of Mr. Luce's testimony?

Dr. DECKER. No, sir, I have not.

Mr. HALL. Mr. Luce, just briefly summarize that for us.

Mr. LUCE. Well from my standpoint, Mr. Chairman, the national interest relates to an historical analysis of the prior benefits we have derived from high-energy physics and that is documented in my paper as being—yielding such results as transistor and microchips in television and medical diagnostic tools and it seems like virtually every part of our daily life and existence has benefitted from high-energy research physics. And it seems to me that we have already seen that in past basic research in the field, there's no reason to think it won't occur again. It's difficult to predict today which exact applications will result, but I think the track record indicates they will be of enormous importance to every American in their daily life.

I would say also that even in this preliminary stage of the SSC we have already yielded significant results that are outlined in my paper and we are improving our capacity every day, all the way from the superconducting cabling to tunneling to more compact microwave amplifiers that help satellite communications and en-

hancements in hardware and software that will enable us to remain in the supercomputer race.

So we think there are significant direct tangible benefits and even on an intangible nature I would say the attraction of many of the world's physicists to our country and keeping our scientists here working in this country, working with industry, so that these technological improvements can work their way into daily life is terribly important and that authorizing construction of this project will be a visible commitment by Congress that we intend to retain our world leadership in science and technology.

Mr. HALL. Could you comment on that, Dr. Decker?

Dr. DECKER. I guess I wouldn't say it much differently than Mr. Luce did; I think he expressed it very well. With basic research such as high-energy physics it is very, very difficult to predict what will come out of research that we might do on a future accelerator like the Superconducting Super Collider. But if you do look back at the track record of this field, the contributions to society I think have been enormous.

There is one thing that I would add: one of the career problems that this country is facing is the shortage of scientific talent. And I really believe that the excitement of a project like the SSC to further explore inner space, as it's been termed, will help attract bright young students into science and I think that we need that very much in this country.

Mr. HALL. This would really be what is almost a wasp's nest to attract scientists and physicists from all over the world, wouldn't it, and certainly to induce young bright minds here to enter the field of science. It's not so sexy as some of the other fields that they're entering today. And to regain a competitive edge that was lost probably in the early Fifties, began to lose and have really relegated ourselves to fourth, fifth or sixth.

Would we have to have—if we had any participation by China—I know the participation by Japan, West Germany, Italy, France and all that's pretty easy for us, but let's assume we had participation by China or Russia, would that require any approval by the National Security Council or some other high-level body and, if so, do you see any problem there?

Dr. DECKER. Certainly the National Security Council and other agencies of the Executive Branch would be involved in the decision if there were a major kind of participation, sort of beyond the normal type of scientific participation in the SSC, I mean, beyond the normal kind of participation that we have today in other U.S. accelerators.

There may be one or two sensitive areas. One that has been identified in the past has been access by Soviet bloc nationals to supercomputers. But we have worked out ways to handle that. We handle it at CERN, for example, so I don't see that as being a real problem.

Mr. PACKARD. I have just a couple of questions, if you wouldn't mind:

The participation by foreign countries, would that predominantly be—with what you've gleaned in your discussions with them to this point, be in producing portions of—manufacturing portions of the collider or cash contributions or both?

Dr. DECKER. Generally cash contributions are difficult for countries to make. It is much easier for them to manufacture hardware and ship it to us. So that's really what we will expect to come out. I would be very surprised if we got cash contributions. I would be very happy if we get...

Mr. PACKARD. There are generally provisions in some of our laws and there very well could be, as we move forward with the SSC, that the buy America clauses would be included in such legislation or in such proposals. What kind of problems would that create for us and would that drive up the cost if we had to conform to certain buy American provisions?

Dr. DECKER. There is, of course, the Buy America Act which we normally use and which is the 6 or 12 percent penalty that foreign manufacturers come up against.

I think you're referring to legislation that might reserve a certain portion of the components to U.S. manufacturers. Is that the sort of thing you're referring to?

Mr. PACKARD. Sometimes there are—the language is such that even the components, it's not the overall project but even components have to have so much American ingenuity into it. That would create some problems for us. I would assume, if in fact there's a certain percentage of the total project that could come from foreign sources, component- wise, then that may not be so difficult to meet, is that what you're suggesting?

Dr. DECKER. I think that we certainly want to see, as I mentioned earlier, U.S. industry heavily involved in this project and that a significant portion of the manufacturing go to U.S. companies. We are a little bit concerned that if we have in legislation a certain percentage of all components be manufactured in the U.S. that that will be inconsistent with guidelines that we have in terms of total foreign participation.

Mr. PACKARD. I see.

Dr. DECKER. And that's a conflict that I continually worry about.

Mr. PACKARD. A separate question, or a different type of a question:

In the President's budget submittal, have you been able to discern whether there has been a reduction of other monies to science because of the $250 million that was included for the SSC, or do you see essentially the same level of commitment in the other areas of science? I think you know that that's been a concern of some members of our Committee and I'm sure some members of Congress and certainly some of our scientists around the country is will other scientific programs suffer because of the SSC. Do you see that in the budget proposal?

Dr. DECKER. No, I don't see that. And I think you know that, when President Reagan decided to go forward with the SSC, he stated that it should not come at the expense of other areas of science and I think every evidence that we have in terms of formulation of the budget, that has not happened.

The President has—in fact, President Bush recently reconfirmed his intent to double the National Science Foundation budget. There are substantial increases in NASA. Within the Department of Energy, I know that the SSC budget has been considered as a sepa-

rate item; it has not caused a reduction in the level of research in other DOE programs.

Mr. PACKARD. Thank you very much, Mr. Chairman. I think I'm through with the questions.

Mr. HALL. Well I think you surely asked the question that I think we're all interested in.

And on page five, I think, of your testimony, Dr. Decker, you stated that the Secretary could issue procurement rules limiting bids on specific components of the project to U.S. companies.

You know, we want to attract foreign participation but we don't want to give them all the good jobs. I guess it's kind of like Congress that wants to shoot an arrow that will hit the taxpayer and miss the voter.

[Laughter.]

How can we do that and what legal authority does DOE have to operate in mandating American-made components, for example?

Dr. DECKER. I believe that under the Competition in Contracting Act there is a section, I believe it's Exception 7 under which the Secretary can make a determination that it is in the best interest of the country to reserve a procurement for U.S. companies.

Mr. HALL. I'm trying to remember what happened to the domestic content legislation, did it pass or not, or did it just get through the House? But would that have any effect on you?

Dr. DECKER. I'm sorry, I don't know the answer to that.

Mr. HALL. I think that was relating only to automobiles. But I guess the Supreme Court gets the last guess at what it relates to. And I wondered if that could be stretched.

One last question and I think it's of import. On Tom Luce's testimony on page seven, he talked about because of foreign participation in the SSC there might be many serious intellectual property rights or issues that had to be addressed.

Mr. Luce, do you want to elaborate on that just a little?

Mr. LUCE. Mr. Chairman, I don't mean to raise those issues as being issues that can't be solved. I merely suggest that when you are negotiating agreements with foreign countries and they're going to put in in-kind contributions I'm sure that there will be, as Dr. Decker mentioned, even regulations worked out regarding access to supercomputers and there may be other issues of an intellectual property nature which I think need to be worked through.

And we're simply saying we think you will maximize foreign contributions in dollars and maximize the terms and conditions of those dollars if we first—Congress appropriate money for construction, the State of Texas put their money in and I think when the two of us have linked arms then it strengthens their hand in dealing with foreign countries to get the best terms and conditions and the most money.

And I just think that will take time and that's why we are willing to front load the first two fiscal years, to allow them time to negotiate those agreements and get the best terms and conditions.

Mr. HALL. And Dr. Decker, have any of these questions raised their ugly heads in any of the negotiations?

Dr. DECKER. Well let me just comment on intellectual property rights. Intellectual property rights issues are, of course, an important part of any agreement that we have in science and technology

with other countries. I think in the last year or two we have worked through sort of standard intellectual property rights clauses now that are used in most all of our agreements with other countries. So I don't see that one particular issue as being a stumbling block in the SSC negotiations.

Mr. HALL. Mr. Sensenbrenner had expressed some fear as to the stopping up of all the scientific dollars into this one big operation to the detriment of small science, and you've already indicate that to this time—he didn't get to stay and hear your answer to that, he had another committee meeting to go to.

But I think for the record why don't you just once again and in closing briefly state whether or not you've found that to be true and whether or not you recognize that as a problem—as a problem that can't be reconciled.

Mr. DECKER. Certainly I do not believe that SSC should come at the expense of other science. It's very important that other areas of science move forward and progress the way we are trying to move forward in high-energy physics.

Certainly to date, to the best of my knowledge, the SSC has had no impact on the funding of other areas of science, and I think that that is evidenced by the Administration's stated intent to double the budget of the National Science Foundation and, as I said earlier, I know that the SSC has not impacted, in any negative way, other areas of research in the Department of Energy.

Mr. HALL. Well we do thank you and I think I would be remiss if I didn't recognize and thank Randy Thompson, DOE Congressional Affairs for her great help and support to this Committee, which we really do appreciate and appreciate the attendance of Henry Gandy here who does a usual good job for the State of Texas.

The record will be kept open for two weeks to receive additional materials from members. And for any of you staffers who are here who have questions that you would have had your members make—propound had they been here, give them to me and we'll send them to these gentlemen and ask them to answer them and we'll keep the record open for that.

If you have any additional questions, we would appreciate your response to these inquiries if we send it to you, Mr. Luce and Mr. Decker.

We do thank you and we are adjourned.

[Whereupon, at 11:52 a.m., the meeting of the Subcommittee was adjourned.]

APPENDIX

I

101ST CONGRESS
1ST SESSION

H. R. 1195

To establish certain requirements with respect to the Superconducting Super Collider project.

IN THE HOUSE OF REPRESENTATIVES

MARCH 1, 1989

Mr. HALL of Texas (for himself and Mr. BARTON of Texas) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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A BILL

To establish certain requirements with respect to the Superconducting Super Collider project.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Superconducting Super Collider Non-Federal Contribution Act of 1989".

SEC. 2. FOREIGN PARTICIPATION.

The Secretary of Energy shall seek to obtain commitments for foreign contributions to the Superconducting Super Collider project (hereinafter referred to as the "project") of an amount not less than 15 percent nor more than 30 percent

of the total fixed cost of the project, as estimated by the Department of Energy in its budget submission to the Congress for fiscal year 1990.

SEC. 3. ELIGIBLE CONTRACT RECIPIENTS.

(a) IN GENERAL.—Except as provided in subsection (b), the Secretary shall award contracts for the project only to—

(1) firms domiciled in the United States which have a majority of ownership by United States nationals;

(2) foreign firms based in a country that is contributing substantially to the project; or

(3) foreign firms that will carry out a majority of their contractual activities within the United States.

(b) EXCEPTIONS.—(1) Subsection (a) shall not apply to joint ventures between a foreign firm and a United States company expressly organized to bid for Superconducting Super Collider project contracts.

(2) For contracts that cannot be fulfilled by firms meeting the requirements of subsection (a) or can be fulfilled by such firms only at a prohibitively higher cost, the Secretary may award such contracts to other firms but only after 30 days after the Secretary has submitted a report to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural

Resources of the Senate explaining the reasons for the contract award.

SEC. 4. FOREIGN MANUFACTURE.

(a) IN GENERAL.—The Secretary shall take such actions as may be necessary to prohibit more than 50 percent of any major system or component of the project from being manufactured in a foreign country.

(b) EXCEPTION.—Subsection (a) shall not apply in any case in which the Secretary—

(1) determines that a system or component of the project is not available from a domestic manufacturer; and

(2) submits a report, at least 30 days before entering into a contract for such system or component, to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate explaining the reasons for such determination.

SEC. 5. STATE CONTRIBUTION.

(a) IN GENERAL.—(1) The Secretary shall negotiate with the State which has been selected for the project to determine a mutually agreeable payment schedule for making contributions to the project.

(2) Such schedule shall not exceed twenty years and not conflict with a State's constitution or spending limits.

(b) USE OF CONTRIBUTIONS.—The State may use contributions from nongovernmental agencies to meet this obligation.

(c) REFUND.—(1) In the event that the construction of the project is not completed, cash payments or in-kind contributions made by the State selected for the project shall be refunded by the Secretary.

(2) Refunds shall be based on the fair market value of the contribution at the time it was made, as determined by the Secretary, and shall be returned to the State in a form and on such terms and conditions as may be mutually agreeable to the Secretary and the State.

(d) DEFINITIONS.—(1) For purposes of this section, the term "in-kind contributions" means contributions other than cash that have a direct impact on the functioning of the project, whether on or off the actual project site, and the expenditures for which would not have been made but for the project.

(2) Such contributions include: materials and labor; technical expertise or studies; improvements made to infrastructure serving the site area (such as roads and highways, airports, water and sewer, electricity and power); land (and associated land, water, and mineral rights); contributions or improvements made to educational or academic facilities in support of research related to the project; housing and other

benefits for those associated with the project; and the cost of subsidies provided to the project (such as energy, water, or materials provided at less than market cost).

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